THURSDAY, MARCH 19, 1903.

A DUTCH PRIME MINISTER ON ECONOMICS.

Principles of Economics. By Dr. N. G. Pierson. Translated from the Dutch by A. A. Wotzel. Vol. i. Pp. xxx + 604. (London: Macmillan and Co., Ltd., 1902.) Price 10s. net.

DR. PIERSON'S book in the original Dutch has become widely known in this country, in spite of the obstacle of language. So much was due to the author on account of his peculiar position as a banker and man of business, as well as a statesman, entitling him to a special hearing as an economist. But the intrinsic qualities of the book have also been such as to attract an appreciative audience. It is an account very largely at first hand of the writer's own experiences in applying economic principles to the daily practice of banking business, and later on to the problems of economics which came before him as Prime Minister of his State. We are glad, therefore, to see the present translation into English, which is extremely well done, and will contribute greatly to extend Dr. Pierson's reputation in this country, well known as he already is.

Dr. Pierson informs us in his introduction that "economics may be described as the science which teaches us what rules mankind should observe in order to advance in material prosperity"; and this appears to be an excellent definition if the qualification be added to the word "rules," that they are to be general rules applicable to every description of industry and business, and not the special rules of each industry by itself. There are many rules, for instance, to be studied and applied by the farmer or banker, each in his own profession, in order to advance in material prosperity, which are no part of the more general economic rules that equally require study. The qualification should also be added, perhaps, that the rules referred to are largely rules to be followed by public men in directing the action of the State where it comes in contact with business—in regulating taxation, monopolies, currency, and any other matters that seem properly reserved for the action of the community as a whole in the conduct of common business. Nothing much, however, turns upon definitions of this kind. In economic books the important thing always is to be in contact with reality, and in this respect Dr. Pierson's book is not lacking. Leading business men and politicians are practically taught how to advance in material prosperity by observing the nature and conditions of exchanges. It is, in fact, thoroughly scientific.

Dr. Pierson's conclusion that the science is mainly deductive may also be accepted. There is often confusion in discussions as to the limits and functions of political economy between the phrases deductive and theoretical. Because it is so much deductive, political economy is often said, with reproach, to be a theoretical study only, and its professors are nicknamed theorists. But the deductions, nevertheless, may be from facts of a general kind, and are thus as legitimate as the propositions of the multiplication table. Dr. Pierson, accordingly, is fully justified in his remark. It should be understood, moreover, that as to large provinces of the study, especially the province of the money market, Dr. Pierson is mainly a describer, and not a theorist, or if, as sometimes happens, he appears to theorise and is not so much a describer, he theorises as Ricardo did—that is, by giving as a theory a description of what business men invariably do under the conditions stated.

We would especially refer students to the closing chapter of the book on foreign exchanges as of singular excellence, containing, perhaps, the fullest exposition ever given of the various puzzles as to balance of trade, balance of payments, and balance of indebtedness, as well as those respecting high and low rates of discount, on which so many people make shipwreck. There has been no more complete exposition of the subject, and what Dr. Pierson has to say may well be compared with Mr. (now Lord) Goschen's "Theory of the Foreign Exchanges" and Mr. Bagehot's "Lombard Street." We are not quite sure we can agree with him throughout as to the regulation of currencies, a subject which we should have liked to see discussed from the point of view of no regulation at all, instead of from the Continental point of view, which accepts regulation as a matter of course; but this criticism in no way diminishes our sense of the value of the discussion itself.

The chapters on the principal monetary systems and on banking in the principal countries are equally complete and interesting, especially when the student remembers that Dr. Pierson himself has had to deal with the business in his capacity as President of the Netherlands Bank and Prime Minister of the Netherlands.

The student will find it both interesting and amusing, we believe, that Dr. Pierson, after an elaborate description of the fall in silver and the ineffectual attempts of bimetallic agitators in the United States and elsewhere to restore the ratio, goes on to describe with effect various practical reasons for believing that bimetallism is no longer a possibility, and then adds a regret that this should be the case, when the opinion had become very general among experts—he himself holding the same opinion—that bimetallism is really possible if only all nations would consent to try it at the same time! We cannot but think this expression of opinion the one symptom of imperfection in the book. The practical reasons against bimetallism—universal or otherwise—are, in fact, found to be based on the mathematical reasoning of Locke, who demonstrated that, as there could be no fixed price between gold and silver, there could be no coexistence of the two as standard money and no joint circulation of the two at any time at a fixed price. But this is a small blemish in a book all but perfect in other respects, which ought to be in the hands of every economic student.

R. G.

PURIFICATION AND DISPOSAL OF SEWAGE.

Sewage Works Analyses. By Gilbert J. Fowler, M.Sc. (Vict.), F.I.C. Pp. vi + 130. (Westminster: King and Son; New York: John Wiley and Sons, 1902.)

THE thanks of all who are directly interested in the disposal and purification of sewage—a rapidly increasing number—are due to Mr. Fowler for his excellent little manual. In his preface he says:—

"The following book has been written in response to several requests for an account of the methods of analysis in use in the laboratory of the Manchester Corporation Sewage Works.

"Through the courtesy of Mr. F. Scudder, the author has been able to include descriptions of some of the more important processes employed in the laboratory of the Mersey and Irwell Joint Committee.

"In general it may be said that the Joint Committee's methods are designed for cases where samples from different works have to be critically examined, the Manchester methods for the analysis of a large number of samples of sewage and effluents of the same general character.

"The successful application of modern bacterial processes will necessitate careful chemical control. It is hoped, therefore, that the following book will prove of use to the increasing number of chemists who are interested in the scientific treatment of sewage.

"The methods here described are such as a considerable experience has shown to be capable of being rapidly executed, and of giving results of an accuracy amply sufficient for practical requirements."

The book opens with a very brief description of the general principles of sewage purification, divided under the two headings:—(*a*) mechanical or disposal processes; (*b*) biological or purification processes, with regard to the second of which the author writes:—

"The changes which take place in all these biological processes are much more complex than those which are effected by any of the mechanical or disposal methods in class (*a*), and chemical control is absolutely necessary if they are to be maintained in their greatest efficiency."

The few pages which are devoted to this section might, we think, be extended with advantage in a future edition. Even allowing for the fact that the work is one intended to deal with analytical methods, a somewhat fuller summary—so far as present knowledge goes—of the changes which take place in septic tanks and bacterial filters, from the pen of one who has made a special study of those points, could not fail to be of direct benefit to the laboratory worker. Such a summary would almost certainly stimulate his interest in the methods with which the book subsequently deals.

After a short discussion on the gauging of sewage flow and upon methods of sampling, the latter a point on which it is difficult to lay too much stress, the author goes on (p. 11) to indicate what in his opinion are the chief chemical data required to determine the amount of impurity in sewage and effluent, the working out of these data being given later in the book. A further portion of the chapter is devoted to the "method of recording results," and here we might add that it is very desirable that some uniform system of records should be adopted throughout the country. The chapter closes with a section on the degree of purity necessary in an effluent, some of the provisional standards adopted by different Rivers' Boards being quoted. This question of standards is too large and thorny a one to be entered into within the limits of a short review, but the author rightly emphasises the point that an effluent should be purified to such a degree that it will not take up oxygen from the water of any stream into which it may flow.

In chapter ii. the well-known "oxygen absorbed" test is discussed at length, and full directions are given for carrying it out; one advantage of this test is that a simple modification of the "three minutes'" test can be applied by any intelligent workman. The chapter concludes with a description of Mr. Scudder's "incubator test," which is now so widely employed.

In the section dealing with the determination of free and "albuminoid" ammonia, the methods followed both in the Manchester Corporation and in the Mersey and Irwell laboratories are detailed at length (p. 44 *et seq.*). The accurate estimation of albuminoid ammonia in sewage effluents is not so simple as it is usually assumed to be, and, as it is a point of much importance, it would be well if some more or less uniform system of procedure could be generally followed.

The determination of nitrates (p. 61) is one of the most important of all estimations in a sewage effluent. The Gladstone-Tribe method (reduction with the copper-zinc couple), which Mr. Fowler himself uses, is probably the most accurate of any, but it has the disadvantage of requiring twelve to twenty-four hours for completion. It is to be noted here that the author recommends the preliminary expulsion of any excess of ammonia present by distillation with steam—a plan which is perhaps better than by simple boiling in an open flask. At the same time a loss of nitrogen is apt to occur here if nitrites are present in any quantity—at least, this is the case with the boiling procedure; it can, however, be prevented, as has been shown by P. Frankland, by the previous addition of a small quantity of some alkali.

In detailing several processes for the determination of dissolved oxygen in effluents, a reference to Winkler's chloride of manganese method, as modified by Rideal, might with advantage have been included.

On pp. 82-85, the determination of the *rate of absorption* of dissolved oxygen by an effluent—perhaps the most important of all the chemical tests—is explained, and various examples are cited.

In the remaining sections of the book there are to be found such important items as the determination of solids in suspension, of supreme consequence in the case of a tank liquor and of an effluent which passes directly into a stream; the collection and examination of the gases evolved from septic tanks and in the interior of filter beds, &c. But enough has already been said to show the comprehensive and exact character of this little volume.

Before closing, two omissions may perhaps be referred to, viz. (1) in any book dealing with the analysis of sewages and effluents, one might naturally expect a reference to be made to the work of the late Sir E. Frankland, Dupré and Adeney; and (2) it is frequently desirable to make a determination of the *total* nitrogen in an effluent, if only as a check on the estimation of the nitrogen in its various forms of ammonia, nitrate, &c. We would, therefore, suggest these points for a future edition, which will no doubt shortly be called for.

Mr. Fowler is to be congratulated on having compressed a great deal of valuable information within short compass, and at the same time in a clear and pleasant style.

G. M.

ANOTHER TEXT-BOOK OF ZOOLOGY.

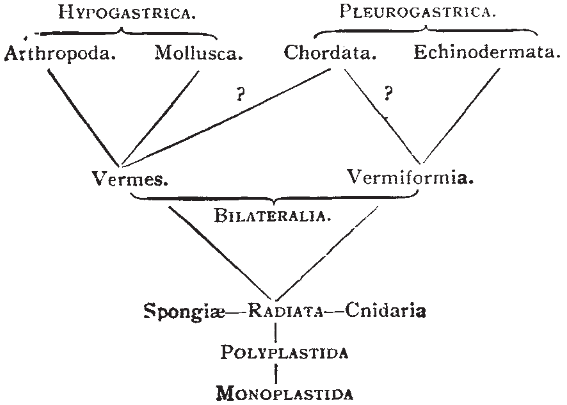
Lehrbuch der Zoologie. By Dr. Alexander Goette, Professor of Zoology in the University of Strassburg. Pp. xii + 504; 512 figs. (Leipzig: Engelmann, 1902.) Price 12*s.* net.

WHAT the illustrious and experienced author proposes in his preface is a text-book for University students—presumed to be serious—a scientific work, a synthetic presentation of the results of analysis, an evolutionist outlook, an exposition in which structure, function, and relationships are to be considered essentially "als Erfolge einer geschichtlichen Wandlung." This is a noble ideal of a text-book, and to say that the outcome falls short of it is only to say that Dr. Goette is human—a busy investigator and teacher, with much more urgent tasks than writing text-books.

The volume begins with a commendably terse introduction of twenty-five pages, in which the author discusses with clearness the basis of a genetic classification; the concepts of analogy, homology, and homoplasy ("Homoidie"); the essential facts regarding cells and protoplasm; the progress of modern zoology; and the evolution theory. He lays emphasis on the intra-organismal causes of the constitutional variations on which natural selection plays the part of the pruning-knife. It is a lucid introduction, but probably too terse and abstract to rivet the attention of the University student, who desires a wealth of concrete illustration and a non-dogmatic mode of argument. In a subsequent chapter, introductory to the Metazoa or Polyplastids, Goette discusses the beginnings of "body-forming" and the associated tax of "natural death," the differentiation of tissues and organs, and the nature of sexual reproduction.

The author's method is to follow the systematic order, and we wish to refer to his classification, which seems ultra-conservative. Thus in the phylum of Monoplastids or Protozoa, he recognises two classes—the Rhizopods and the Infusorians. The Sporozoa appear as an appendage of the Rhizopods and the Suctoria as an order of Ciliata. We do not find that Goette gives any reasons for this maltreatment. In the next section, which deals with radially symmetrical animals ("Radiata"), the Sponges are discussed in an elementary fashion in four pages, and classified as horny, flinty, and calcareous—again without a hint of phylogenetic relationships; and while the Cnidaria or Cœlenterates are more fully discussed, divided into Hydrozoa and Scyphozoa (including Ctenophora), we get no picture of the possible evolution of the phylum. We have the same comment to make throughout, that although the treatment of the various classes and subclasses is clear and terse, there is little of that evolutionary discussion of the phyletic affinities which the preface led us to expect.

Goette divides bilaterally symmetrical animals into Hypogastrica and Pleurogastrica, the former including Vermes, Arthropoda and Mollusca, the latter including Vermiformia, Echinoderma and Chordata. His scheme is as follows:—



In Hypogastrica, the gastrula is elongated in the direction of its transverse axis, and its slit-like blastopore (prostoma) lies ventrally, and coincides anteriorly with the formation of the mouth; in Pleurogastrica the gastrula is elongated in the direction of its longitudinal axis, and the compressed prostoma usually becomes the anus, the mouth being a new formation anteriorly.

In the phylum Vermes, the Nemerteans are ranked, without argument, as a third order of Turbellaria; and the Nematodes are placed as a class beside Annelids in the subphylum Cœlhelminthes, though the cavity of the nematode body is spoken of distinctly enough as a pseudocœl, not a cœlom. Echiurids and Sipunculids are slumped together as Gephyrea, and the appendix to the Vermes includes (1) Bryozoa, (2) Rotifers, and (3) Brachiopods.

There is less eccentricity in the treatment of Arthropods and Molluscs, which receive a full and yet admirably terse discussion. The Trilobites are ranked as an appendix to Entomostraca, the Eurypterids and King-Crabs as a third subclass of Crustacea. The author's Vermiformia, with which the pleurogastric group of phyla begins, include Chætognatha and Enteropneusta, with Cephalodiscus and Rhabdopleura appended to the latter. After a clear account of the Echinoderma, Prof. Goette passes to chordate animals: he dignifies Ascidiæ, Appendiculariæ and Salpæ as separate classes of the subphylum Tunicata; the Lancelets represent the second subphylum, and Vertebrata the third. Cyclostomes are ranked as a class of Pisces, but distinguished sharply from